

CONTROL SYSTEM

This invention relates to a control system for controlling electrical appliances over the telephone network.

In accordance with this invention, there is provided a control system for controlling one or more electrical appliances, comprising means for connection to a telephone line and arranged to respond when the appropriate telephone number is called, and control means for then responding to audio tones received over the telephone line to control the electrical appliances remotely, the control means also being responsive to audio tones generated by use of a keypad of the control system to control the electrical appliances locally.

The control system is particularly useful for switching on or off electrical appliances, including electrical power supplies, and may control on/off switches additional to or replacing the on/off switches of the appliances themselves.

The control system thus enables electrical appliances to be switched on or off from any remote location, by the user calling the appropriate telephone number from any telephone connected to the public telephone network, and then transmitting selected tones to achieve the required control operation.

The control system may be used for example in the home and for example for the remote switching on and off of central heating systems, air conditioning systems, internal and external lights, greenhouse heating, electric blankets or any other appliance which is controlled by switching on or off its electrical supply.

The control system enables the controlled appliances to be switched on or off locally, in addition to enabling them to be switched on or off remotely. Therefore the control system includes a keypad for controlling the appliances locally by keying in selected codes to effect the required switching operations. Preferably audio tones generated by the

four digits. Preferably a reset function may be used to permit subsequent attempts e.g. if the user keys in his security code incorrectly. If no correct security code is received by the control system within a predetermined time, preferably it goes off line silently. However if a correct security code is received preferably the control system then acknowledges this by transmitting a distinctive tone. Preferably now a predetermined time period is allowed for effecting control operations. Preferably as each tone is transmitted by the user, the control system responds with an acknowledgement tone: preferably this tone is generated only upon release of the key by the user, so that the user will not miss the acknowledgement tone by pressing the key too long.

In effecting a control function in local or remote modes, the user will need to select the appliance to be controlled and then give a "switch on" or "switch off" command. For example, the channel for the appliance concerned may be selected by entering the channel number, e.g. 1, and then # to switch it on.

Preferably after entering security code the control system enables the user to determine the status of each channel remotely. For example, the user when connected enters just the number of the channel he wishes to check: the control system transmits a distinctive tone (e.g. the interrupted tone) if it is switched on: preferably the system now requires # to be entered to maintain the "on" status of the channel, or * to switch it off. Preferably the system requires either # or * to be entered within the allowed time period, otherwise the system maintains the same channel status as before it was called. Preferably the system also responds to a command to switch all channels off simultaneously, e.g. 0*.

Preferably the time period allowed by the system to effect control functions is adjustable. Preferably just before the system times out, it gives a warning tone: preferably in the short time remaining the user may extend or reset the

system in place of or in parallel with a normal telephone or answerphone. In use, if a caller rings in over the public telephone network from a remote location whilst the system is switched to remote mode, a ring detect circuit 10 detects this and initiates a timer 12 via an opto-isolator 11. After a pre-determined time period set by timer 12, relay contacts RL1 are closed to enable the system to receive and transmit tones via a line interface 25.

The system includes a driver 13 and a tone generator 15 which transmits various tones at different times but which also transmits a short tone when the system picks up at RL1 and just before the timer 12 times out. The system includes a decoder 14 to receive and decode tones either transmitted to it over the public telephone system (e.g. from a hand held unit 28) or passed to it by a local tone generator 15 under control of a keypad 16 of the system control panel. Once it has picked up, the system requires the user (if remote) to transmit a predetermined security code and this is decoded at 14 and checked at 17: if it is correct, the tone generator 15 transmits an acknowledgement tone.

Once the security code has been approved, security decoder 17 enables a further decoder 18 to decode subsequently transmitted tones and control a logic circuit 19 which controls the tone generator 15 to send back appropriate acknowledgement etc, codes. Logic circuit 19 also controls output relays e.g. 20 for different channels via respective buffers 21 and opto-isolators 22. Instead of or additionally output relays 20 may be controlled via encoded transmission 26 and encoded reception 27 using mains wiring or radio frequencies as transmission medium. The relays 20 control on/off switches 23 for the respective channels, to switch on or off electrical appliances or power supplies controlled thereby. LEDs 24 are provided in the control panel for each channel to indicate its status and an LED 29 is also provided in the control panel to indicate whether the system is in local or

CLAIMS

1. A control system for controlling one or more electrical appliances, comprising means for connection to a telephone line and arranged to respond when the appropriate telephone number is called, and control means for then responding to audio tones received over the telephone line to control the electrical appliances remotely, the control means also being responsive to audio tones generated by use of a keypad of the control system to control the electrical appliances locally.
2. A control system as claimed in claim 1, arranged to detect a security code received over the telephone line before enabling the system to respond to said audio tones to control said appliances.
3. A control system as claimed in claim 2, arranged to verify receipt of a correct security code by transmitting an acknowledgement tone over the telephone line.
4. A control system as claimed in claim 2 or 3, arranged to disconnect from the telephone line if a correct security code is not received within a predetermined period.
5. A control system as claimed in any one of claims 2 to 4, arranged to disconnect from the telephone line if no audio tones are received from the caller in a predetermined time after detecting a correct security code.
6. A control system as claimed in any one of claims 2 to 5, arranged to transmit an acknowledgement tone in response to each audio tone received over the telephone line after detecting a correct security code.

15. A control system as claimed in claim 14, further comprising a visual indication of remote or local status.

16. A control system as claimed in claim 14 or 15, arranged to bypass the requirement for the security code when in local mode.

17. A control system as claimed in any preceding claim, arranged to transmit a predetermined tone when the system picks up in response to a call over the telephone line.

18. A control system as claimed in any preceding claim arranged to respond to said audio tones when of dual tone multi frequency (DTMF) type.

19. A control system as claimed in any preceding claim, in which the time before the system picks up in response to a call over the telephone line can be adjusted.

20. A control system as claimed in any preceding claim, which further includes on/off switches for controlling said electrical appliances.

21. A control system substantially as herein described with reference to the accompanying drawing.

22. A control system as claimed in any preceding claim, when connected in parallel with another telephone apparatus, e.g. a telephone answering machine.

23. A control system as claimed in any preceding claim, further comprising a separate tone generator unit for generating audio tone for transmission to the control system from a remote location over the telephone network.